REMARKS

This paper is responsive to any paper(s) indicated above, and is responsive in any other manner indicated below.

PENDING CLAIMS

Claims 1-26 were pending, under consideration and subjected to examination in the Office Action. Appropriate claims have been amended, canceled and/or added (without prejudice or disclaimer) in order to adjust a clarity and/or focus of Applicant's claimed invention. That is, such changes are unrelated to any prior art or scope adjustment and are simply refocused claims in which Applicant is present interested. At entry of this paper, Claims 1-26 remain pending for further consideration and examination in the application.

CLAIM OBJECTIONS OBVIATED VIA CLAIM AMENDMENT

Claims 1, 8, 15, 18-19 and 23 have been objected to because of the Office Action concerns listed within the item 1 on page 2 of the Detailed Action portion of the Office Action. As amendments have been made where appropriate in order to address each of the Office Action listed concerns, reconsideration and withdrawal of the claim objection are respectfully requested.

REJECTION UNDER 35 USC '102

The 35 USC '102 rejection of claims 1-26 as being anticipated by Mok et al. (U.S. Patent 6,799,976) is respectfully traversed. However, such rejections have been rendered obsolete by the present clarifying amendments to Applicant's claims, and accordingly, traversal arguments are not appropriate at this time. However,

Applicant respectfully submits the following to preclude renewal of any such rejections against Applicant's clarified claims.

All descriptions of Applicant's disclosed and claimed invention, and all descriptions and rebuttal arguments regarding the applied prior art, as previously submitted by Applicant in any form, are repeated and incorporated hereat by reference. Further, all Office Action statements regarding the prior art rejections are respectfully traversed. As additional arguments, Applicant respectfully submits the following.

In order to properly support a '102 anticipatory-type rejection, any applied art reference must disclose each and every limitation of any rejected claim. The applied art does not adequately support a '102 anticipatory-type rejection because, at minimum, such applied art does not disclose (or suggest) the following discussed limitations of Applicant's claims.

Applicant's disclosed and claimed invention is directed toward providing probing arrangements having a high density of contact terminals, and which can be reliably contacted to an integrated circuit (IC) sample even if height irregularities (e.g., warpage) exist. To accomplish reliable contact even in the event of height irregularities, Applicant's disclosed and claimed invention mainly uses a flexible sheet, e.g., including a polyimide layer. To maintain reliable contact of each respective contact terminal, each of Applicant's contact terminals are supported by polyimide. More particularly, Applicant's FIG. 11F, for example, shows a single example contact terminal 8 which is back supported by the polyimide layer 89.

In terms of explicit claim language, independent claim 1, for example, recites: "wherein each of the contact terminals is supported by polyimide." All other ones of Applicant's claims have similar or analogous limitations.

In contrast, Mok utilizes a peeled plate spring turned up partially, so that the pad surface of the tested object is contacted by using the bending of the plate spring. Such Mok plate springs are **not supported by polyimide**, and instead, rely upon the inherent resiliency of the plate spring to maintain contact. Mok's arrangement is disadvantageous in that, over time, ones of the plate springs will lose resiliency and thus Mok's probing arrangement will lose reliability.

In addition to the foregoing, the following additional remarks from Applicant's foreign representative are also submitted in support of traversal of the rejection and patentability of Applicant's claims.

One important feature of the present invention exists in that the contact terminal and the extraction wiring for extending the pitches, are provided on a probe sheet formed mainly of a thin film formed of flexible polyimide. Accordingly, since the probe sheet (on which the contact terminals for contact with the wafer of the inspected object is provided) is flexible as a whole, reliable contact can be kept even in accordance with any warpage of the wafer, so that the probe card for inspecting a plurality of semiconductor devices simultaneously can be realized.

In addition, since the pitches are extended on the probe sheet, the narrow pitches of the electrodes of the semiconductor device provided on the wafer can be realized.

On the other hand, Mok discloses an extension of the pitches. However, in Mok, the pitches are extended on the substrate (16/Fig.14 of Mok). In addition, in Mok, a hard substrate (more concretely ceramic, ceramic glass, glass and silicon) is proposed as the substrate (Column 10, Lines 61-63 of Mok). Thus, Mok is remarkably different from the present invention having pitches extended on the probe sheet. As a result, it is respectfully submitted that the present invention

cannot be invented easily from Molt which uses a hard substrate. Further, in Molt, since it is difficult with a hard substrate to keep contact in accordance with any warp of the wafer, the purpose of the present invention cannot be attained.

Another important feature of the present invention exists in that a metal sheet (separated from the electrode pad) may be provided on the probe sheet. As a result, the probe sheet formed of polyimide may be provided with the predetermined structural strength. In addition, the coefficient of linear expansion of the metal sheet is made to match that of the wafer, to prevent any positional deviation that may be otherwise caused in the test by any change in temperature, thus to keep the positional precision.

In contrast, Mok does not disclose that a metal sheet may be provided on the substrate (16/Fig.14) except the electrically conductive connections (64a-64n/Fig.14). In addition, since Mok discloses a hard substrate arrangement, even if the metal sheet is provided on the substrate, an improvement of the structural strength and matching with the wafer's coefficient of linear expansion cannot be realized. As a result, it is respectfully submitted that the content that the metal sheet provided on the probe sheet cannot be thought of easily from Mok.

A further important feature of the present invention exists in that the heating element is provided to implement the temperature adjustment of the probe card individually. In addition, another feature of the present invention exists in that the heater is provided with the sample stage to implement the temperature adjustment individually.

On the other hand, Molt does not disclose that a heating element is provided with the probe card and a heater is provided with the sample stage to implement the temperature adjustment individually.

A remainder of comments to follow represent inventor comments. More particularly, regarding a feature of the present invention, in the present invention, in the region corresponding to the wafer, the contact terminal and the extraction electrodes are formed with the "thin film sheet" in one body. Then, the wirings (the spring probes, the wiring probes, or the bonding wires, for example) are drawn out vertically from the extraction electrode of which pitches are wider than those of the contact terminal) so that the wirings are connected to the electrode of the multi-layer wiring substrate. The purpose of the present invention is to realize a probe card for inspecting the electric characteristic of the semiconductor device by such a constitution that the wafer is inspected through the electrode by the tester. Namely, in the present invention, the probe card with an excellent contact resistance value can be realized by the constitution that a contact terminal of a truncated pyramidal shape is formed on the polyimide film by using the square pyramidal shape of the silicon or the anisotropic etching hole of the square pyramidal shape as the mold of the contact terminal.

In addition, in the present invention, it becomes easy to design a microstrip fabricated by thin film techniques and the probe sheet of the pair lines structure. Then, the components of the test circuit including a capacitor, resister, fuse and so on, can be disposed on the multi-layer wiring substrate near the chip. So, in the present invention, the probe card which remarkably improves an electric characteristic can be realized.

Further, in the present invention, the polyimide probe sheet is adhered to with the metal film (42 alloy sheet) having a coefficient of linear expansion equivalent to that of Si, so that the probe sheet having the narrow pitches with the high positional

precision of the pointed end can be fabricated in the lump together. So, a probe sheet enabled to inspect many chips simultaneously can be realized.

In the probe sheet, the probe sheet and the extraction probe sheet are constituted to be removable, and the multi-layer wiring substrate can be shared in common.

Mok (US6,799,976B1) proposes a test apparatus which comprises a probe card assembly using a probe spring which is formed by a turned-up the portion of the metal layer evaporated on the surface of the hard substrate through etching. Molt proposes that a consecutive metal layer formed by the plasma evaporation method is applied to the undercut etching by the photolithographic patterning method, so that the (comb-like) conductive spring (the "pattern-type probe spring") turned up and bent (due to the internal stress of the multi-layer) is formed on the substrate to form the probe spring. Such a probe spring is used as the probe. aln addition, Mok proposes for improving the stability of the contact resistance value, the structure for penetrating into the oxide layer of the pad by using the opposing interleaved photolithographic springs 34a and 34b (Fig.7) and the shoulder-point photolithographic spring 50 (Fig.10). The plate spring probe described above is formed by the hard substrate 16 (ceramic, glass or silicon). Mok proposes the constitution that the opposite surface is formed on the hard substrate by forming a hole by a laser, filling with plating, polishing the surface and so on, so that the "photolitbographic spring" is formed on the opposite surface as the contact terminal for the signal extraction for the "print wiring board probe card". Note that since Molt does not disclose the fabrication process concretely, the characteristic of the materials and the pattern precision are not known. Further, in the structure of Mok, the hard substrate is hung by the bridge and the plate spring. (Fig. 15 of Mok)

In Mok, the metal layer evaporated on the surface of the hard substrate (including ceramic, glass, silicon and so on) by plasma evaporation is applied to the pattern etching to form the probe having the plate spring turned up partially, so that the pad surface of the tested object is contacted by using the bending of the plate spring. On the other hand, in the present invention, the spring probe is pressed by the probe sheet that the contact terminal of the square pyramidal shape and the extraction wiring are formed with the flexible polyimide sheet in one body. So, the present invention is different from Mok in the fabrication method, the constitution and the effect (the stability of the contact resistance value) of the probe card.

For forming the plate spring of Mok, restrictions are caused in the dimension and the pattern arrangement so as to avoid mutual overlap of the respective plate spring regions. As no concrete dimensions are disclosed in Molt, even if the fabrication method is assumed, since the dimensions necessary for forming the plate spring are large, it is difficult to form a probe used for the narrow pitches of several tens microns. Further, in Mok, for forming the plate spring, since it is necessary to use the hard substrate including ceramic, glass, silicon and so on and which endures the internal stress within the evaporated metal layer, it is impossible to form the plate spring as the contact terminal on the flexible sheet of the present invention without the hard substrate. As a result, in Mok, since the hard substrate is used to form the plate spring, it becomes necessary to form the hole through the substrate, polish the substrate and so on as the flew fabrication steps for thawing the wiring from the front surface to the opposite surface. So, the fabrication steps of Mok are different from those of the present invention that the probe sheets are stacked successively together.

In Mok, the real surface of the pad material is contacted by the plate spring through sliding the pad of the inspected object similarly to the cantilever method of the prior art using the metal wire probe. On the other hand, in the present invention, the contact terminal (the square pyramidal shape having the clear edge) formed on the flexible probe sheet is contacted vertically on the pad of the inspected object to realize the stable resistance value. As described, the contact method of the present invention is different from that of Mok also in the contact reliability, the narrow pitches and the multi-pins.

In Mok, since the plate spring is used as the contact terminal, namely the probe, scratches caused by the probe becomes large, so that it becomes difficult to apply the plate spring to the miniaturized electrode pad with the narrow pitches. In addition, in Mok, since the waste of the scratch is formed and attached, the contact resistance value becomes unstable and the short circuit may be caused during the test by the waste of the scratch. On the other band, in the present invention, since the contact terminal is formed to become the figure having the edge (the square pyramid) by using the hole formed by the anisotropic etching as the mold, the contact resistance value becomes stable in the contact with the electrode pad.

As explained above, the present invention is different from Mok in the fabrication method, the constitution and the effect. So, the present invention cannot be anticipated by Mok.

As a result of all of the foregoing, it is respectfully submitted that the applied art would not support a '102 anticipatory-type rejection of Applicant's claims. Accordingly, reconsideration and withdrawal of such '102 rejection, and express written allowance of all of the '102 rejected claims, are respectfully requested.

EXAMINER INVITED TO TELEPHONE

The Examiner is herein invited to telephone the undersigned attorneys at the local Washington, D.C. area telephone number of 703/312-6600 for discussing any Examiner's Amendments or other suggested actions for accelerating prosecution and moving the present application to allowance.

RESERVATION OF RIGHTS

It is respectfully submitted that any and all claim amendments and/or cancellations submitted within this paper and throughout prosecution of the present application are without prejudice or disclaimer. That is, any above statements, or any present amendment or cancellation of claims (all made without prejudice or disclaimer), should not be taken as an indication or admission that any objection/rejection was valid, or as a disclaimer of any scope or subject matter. Applicant respectfully reserves all rights to file subsequent related application(s) (including reissue applications) directed to any/all previously claimed limitations/features which have been subsequently amended or cancelled, or to any/all limitations/features not yet claimed, i.e., Applicant continues (indefinitely) to maintain no intention or desire to dedicate or surrender any limitations/features of subject matter of the present application to the public.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully submits that the claims listed above as presently being under consideration in the application are now in condition for allowance.

To the extent necessary, Applicant petitions for an extension of time under 37 CFR 1.136. Authorization is herein given to charge any shortage in the fees, including extension of time fees and excess claim fees, to Deposit Account No. 01-2135 (Case No. 500.43175X00) and please credit any excess fees to such deposit account.

Based upon all of the foregoing, allowance of all presently-pending claims is respectfully requested.

Respectfully submitted,

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